Tech Fact Sheet

Oak Ridge National Laboratory ***Tennessee***

GammaCam™ Technology Demonstration at ORNL Buildings 3026C and 3026D

Challenge

Buildings 3026C and 3026D at the Oak Ridge National Laboratory (ORNL) are in an advanced stage of deterioration. Rainwater damage and physical aging have reduced the structural integrity of these facilities to the point where human entry is restricted. Consequently, most activities within these facilities have ceased, including internal surveillance and maintenance. Characterization of contaminants of concern both inside and near the building is problematic. Technology is needed to remotely detect and quantify radiological contamination in facilities/spaces not fit for human entry due to physical, chemical or radiological conditions.

Figure 1: ORNL – Building 3026

Tech Solution

The GammaCam™ is a commercially available portable gamma ray imaging system that provides two-dimensional spatial mapping of gamma ray emitting nuclides in real time. The GammaCam™ imaging system is comprised of a sensor head and a rugged laptop computer. The user's exposure to radiation fields is minimized because of the sensor's ability to operate at distances of 5 to 30 feet from the area being imaged. In addition, the portable computer can be positioned up to 100 feet from the sensor head. Using the GammaCam™, an operator can perform preliminary characterization of an area and identify the precise location of sources of gamma radiation while minimizing his/her exposure. Composite images generated by the system are presented on the computer display with radiation intensity shown in pseudo color over a conventional black and white video image. The exposure time required to produce an image for a given gamma radiation source depends on several factors, including gamma ray energy, source strength, distance to the source, and the distribution of the source.

Figure 2: Gamma Cam™

Site Project & Identifier	Tech Stage: Demonstration
ORNL (remote detection and quantification of radiological contamination)	Demonstration of GammaCam™ technology at ORNL buildings 3026C and 3026D.

Tech Accomplishments

The GammaCam™ was chosen and demonstrated in April 2009 at ORNL Building 3026. During imaging, the distance between the GammaCam™ and the pipe being imaged ranged from 5 to 50 feet with imaging times from 40 to 120 minutes. The GammaCam™ system was easily deployed in the field. It required minimal training for operation and only one power cord for the sensor head and the laptop computer. The GammaCam™ sensor head is portable and easily mounted on the Genie lift for imaging the pipe remotely. The results of the scan are displayed in Figure 3. Physical samples were obtained from the ductwork, and the GammaCam™ measurements were calibrated with that data. The GammaCam™ results correlated closely with surface measurements taken from hand-held instruments. As a result, the team was able to quickly, safely and accurately identify areas of gamma contamination and corresponding dose rates with the GammaCam™ system.

Figure 3: Detection and quantification of radiological contamination using GammaCam™

Impact

The GammaCam™ system is an effective tool for remotely identifying high gamma radiation in radioactive environments. Its versatility allows the user to perform preliminary characterization of an area to determine the location of gamma emitting radioactive sources while minimizing the exposure to workers. However, its specificity to gamma sources is also an obvious limitation since it will not detect alpha and beta sources.

Impact and Features

- Remote operation and control for safe image acquisition in areas of unknown and/or high gamma radioactive environments where human entry is unsafe
- Minimizes worker exposure due to remote imaging at distances of 5 to 30 feet or more
- Large areas can be characterized efficiently
- High spatial resolution and sensitivity
- Easy setup, user friendly and portable

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Challenge Category	Tech Solution Category
• Deactivation and decommissioning • Contaminant location identification • Worker health and safety	• Surveillance and maintenance • Characterization • Radiological survey • Remote detection and quantification of gamma radiological contamination